TRANSMITTING WEB PAGES IN A PLURALITY OF ALTERNATE READABLE MODES SELECTABLE TO DIRECT USERS HAVING DIFFERENT READING SKILLS TO READ ALONG A WORLD WIDE WEB PAGE

5 Technical Field

The present invention relates to computer managed communication networks such as the World Wide Web (Web) and, particularly, to systems, processes and programs for directing users of different reading skills in reading
10 through Web pages.

Background of Related Art

The past decade has been marked by a technological revolution driven by the convergence of the data processing industry with the consumer electronics
15 industry. The effect has, in turn, driven technologies which have been known and available but relatively quiescent over the years. A major one of these technologies is the Internet or Web related distribution of documents, media and programs. The convergence of the
20 electronic entertainment and consumer industries with data processing exponentially accelerated the demand for wide ranging communication distribution channels, and the Web or Internet, which had quietly existed for over a generation as a loose academic and government data
25 distribution facility, reached "critical mass" and commenced a period of phenomenal expansion. With this expansion, businesses and consumers have direct access to all matter of documents, media and computer programs.

In addition, Hypertext Markup Language (HTML), which
30 had been the documentation language of the Internet or Web for years, offered direct hyperlinks between Web

pages embedded in such Web pages. This even further exploded the use of the Internet or Web.

As a result of these changes, it seems as if virtually all aspects of human endeavor in the

5   industrialized world require human-computer interfaces. These changes have made computer directed activities accessible to a substantial portion of the industrial world's population which, up to a few years ago, was computer-illiterate, or, at best, computer indifferent.

10 Although Web documents or pages in languages other than English are available via the Web, English has become the predominant language of the Web. Consequently, there are millions of people accessing Web pages in English who have limited reading skills in the English language of

15 the Web.

In addition, computer controlled communications networks, such as the Web, have been significant in expanding work opportunities for visually and physically impaired people. The computer may be tailored to the

20 unique abilities of each visually or physically impaired individual. To this end the computer industry is continuously seeking new implementations to bring more and more visually and physically impaired individuals into full productivity in the work force.

25 Unfortunately, the layout and content of current Web or Internet (the two terms are used interchangeably herein) pages works against ease of use by the physically impaired and, particularly, the visually impaired. The display screens on which Web pages are presented to the

30 user usually has a great amount of "clutter" surrounding and intruding into the content of the Web page itself. There are usually text and images left over from previous pages at various prior browsing levels. There is

advertising going off in all directions on the page.
Also, with Web pages, we do not have the situation of a
relatively small group of professional designers working
out the human factors. Although a great many Web pages

5   are communicative and well laid out, in actuality anyone
and everyone can design a Web page. As a result, Web
pages are frequently set up and designed in an eclectic
manner and have the clutter described above. Thus, on
the Web page display screen it is difficult and

10 frustrating, particularly for people with physical,
visual and reading limitations to ignore all of the
clutter and concentrate on directing their reading
through the intended content of the Web page.

Summary of the Present Invention

15   The present invention is directed to a unique Web
page function, i.e. a system and program for directing
users of varying and particularly limited reading skills
through a reading of a received Web page which helps such
users to ignore Web page clutter and focus on the

20 direction and flow of the page content. The Web page is
transmitted in a plurality of selectable readable modes,
at least one of which modes includes a movable indicator
directing the user to read along the Web page in a
predetermined orthogonal progressive pattern. The

25 movable indicator is preferably an element highlighting a
sequential block of data. For example, the highlighted
block of data may be brighter than the other data on the
Web page or have a color different from the color of the
other data on the Web page. The Web page is transmitted

30 over the Web in a markup language comprising control tags
enabling the Web page to be selectively read in said
moving indicator mode, and there are means at said

receiving Web station for selectively reading said
received Web page in said moving indicator mode. The
means for reading the Web page in any of a variety of
indicator modes is preferably in a Web browser associated
5   with the receiving Web station.

The dimensions of the indicator element may be
selectively varied. The speed at which the indicator
element progressively moves along said page to direct the
reading of the user may also be selectively varied.
10   Also, text within the moving indicator block may be
enlarged in size to help visually impaired users.

In accordance with another aspect of the invention,
a plurality of the movable indicators may be
simultaneously used so that each of the highlighted
15   blocks of data within each of said plurality of
indicators has a color respectively different from the
blocks of data within the other indicators.

The Web page is customarily transmitted in Hypertext
Markup Language and includes text. In Web pages
20   including text, the highlighted block may be a
grammatical unit. Also, where a plurality of highlighted
blocks are used, a different type of grammatical unit may
be in each block, e.g. subject, verb and predicate.

Brief Description of the Drawings
25   The present invention will be better understood and
its numerous objects and advantages will become more
apparent to those skilled in the art by reference to the
following drawings, in conjunction with the accompanying
specification, in which:
30   Fig. 1 is a block diagram of a generalized data
processing system including a central processing unit
which provides the computer controlled interactive

display system which may be used in practicing the
present invention;

Fig. 2 is a generalized diagrammatic view of a Web
portion upon which the present invention may be

5   implemented;

Fig. 3 is a diagrammatic view of a typical Web page
displayed at a receiving display station;

Fig. 4 is the diagrammatic Web page view of Fig. 3,
after a user has decided to read the Web page with the

10   aid of a movable indicator in accordance with the present
invention and has brought up a menu of selectable
indicators;

Fig. 5 is the Web page view of Fig. 4 wherein the
user has chosen to read the Web page in a mode wherein

15   the highlighted indicator block is a text sentence unit;

Fig. 6 is the Web page view of Fig. 5 indicating the
reader indicator progression to the next sentence;

Fig. 7 is the Web page view of Fig. 4 wherein the
user has chosen to read the Web page in a mode wherein

20   the highlighted indicator block increases the size of,
i.e. enlarges, the text;

Fig. 8 is the Web page view of Fig. 4 wherein the
user has chosen to read the Web page in a mode wherein a
plurality of highlighted indicator blocks are used;

25   Fig. 9 is an illustrative flowchart describing the
setting up of the process of the present invention for
providing movable indicators directing users through the
content of the Web page; and

Fig. 10 is a flowchart of an illustrative run of the

30   process setup in Fig. 9.

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Detailed Description of the Preferred Embodiment

Referring to Fig. 1, a typical data processing
terminal is shown which may function as the Web display
stations used for receiving Web pages, for requesting Web
5   searches and for Web browsing.

A central processing unit (CPU) 10, such as one of
the PC microprocessors or workstations, e.g. RISC
System/6000™ (RS/6000) series available from
International Business Machines Corporation (IBM), is
10 provided and interconnected to various other components
by system bus 12. An operating system 41 runs on CPU 10,
provides control and is used to coordinate the function
of the various components of Fig. 1. Operating system 41
may be one of the commercially available operating
15 systems such as the AIX 6000™ operating system available
from IBM; Microsoft's Windows98™ or WindowsNT™, as well
as UNIX and AIX operating systems. Application programs
40, controlled by the system, are moved into and out of
the main memory Random Access Memory (RAM) 14. These
20 programs include the programs of the present invention
for providing to the Web page user a plurality of
selectable modes for reading the Web using movable
indicators for directing the Web page content to be read
in a predetermined orthogonal direction. The programs
25 will be subsequently described in combination with any
conventional Web browser, such as the Netscape Navigator
3.0™ or Microsoft's Internet Explorer™· A Read Only
Memory (ROM) 16 is connected to CPU 10 via bus 12 and
includes the Basic Input/Output System (BIOS) that
30 controls the basic computer functions. RAM 14, I/O
adapter 18 and communications adapter 34 are also
interconnected to system bus 12. I/O adapter 18 may be a
Small Computer System Interface (SCSI) adapter that

communicates with the disk storage device 20.
Communications adapter 34 interconnects bus 12 with an
outside network enabling the data processing system to
communicate with other such systems over a Local Area

5 Network (LAN) or a Wide Area Network (WAN), which
includes, of course, the Web or Internet. The latter two
terms are meant to be generally interchangeable and are
so used in the present description of the distribution
network. I/O devices are also connected to system bus 12

10 via user interface adapter 22 and display adapter 36.
Keyboard 24 and mouse 26 are all interconnected to bus 12
through user interface adapter 22. It is through such
input devices that the user may interactively relate to
Web pages. Display adapter 36 includes a frame buffer

15 39, which is a storage device that holds a representation
of each pixel on the display screen 38. Images may be
stored in frame buffer 39 for display on monitor 38
through various components, such as a digital to analog
converter (not shown) and the like. By using the

20 aforementioned I/O devices, a user is capable of
inputting information to the system through the keyboard
24 or mouse 26 and receiving output information from the
system via display 38.

Before going further into the details of specific

25 embodiments, it will be helpful to understand from a more
general perspective the various elements and methods
which may be related to the present invention. Since the
major aspect of the present invention is directed to Web
pages transmitted over global networks, such as the Web

30 or Internet, an understanding of networks and their
operating principles would be helpful. We will not go
into great detail in describing the networks to which the
present invention is applicable. For details on Web

nodes, objects and links, reference is made to the text, <u>Mastering the Internet</u>, G. H. Cady et al., published by Sybex Inc., Alameda, CA, 1996; or the text, <u>Internet: The Complete Reference, Millennium Edition</u>, Margaret

5   Young et al., Osborne/McGraw-Hill, Berkeley, CA, 1999. Any data communication system which interconnects or links computer controlled systems with various sites defines a communications network. Of course, the Internet or Web is a global network of a heterogeneous

10   mix of computer technologies and operating systems. Higher level objects are linked to the lower level objects in the hierarchy through a variety of network server computers.

       Web documents are conventionally implemented in

15   markup languages such as the HTML language, which is described in detail in the text entitled <u>Just Java</u>, van der Linden, 1997, SunSoft Press, particularly at Chapter 7, pp. 249-268, dealing with the handling of Web pages; and also in the above-referenced <u>Mastering the Internet</u>,

20   particularly pp. 637-642, on HTML in the formation of Web pages. As will be further described hereinafter, the Web owner or Web page designer, through the inclusion of appropriate control tags, may provide the user receiving the Web with the option of reading the page in any of

25   plurality of modes most suited to the users reading skills.

       In addition, aspects of this invention will involve Web browsers. A general and comprehensive description of browsers may be found in the above-mentioned <u>Mastering</u>

30   <u>the Internet</u> text at pp. 291-313. More detailed browser descriptions may be found in the above-mentioned <u>Internet: The Complete Reference, Millennium Edition</u> text, Chapter 19, pp. 419-454, on the Netscape Navigator;

Chapter 20, pp. 455-494, on the Microsoft Internet
Explorer; and Chapter 21, pp. 495-512, covering Lynx,
Opera and other browsers.

Web pages are generally located on the Web through
5   search engines. As described in the above-mentioned
Internet: The Complete Reference, Milleniun Edition
text, pages 395 and 522-535, search engines use keywords
and phrases to query the Web for desired subject matter.
The search engine usually uses a search agent called a
10 "spider" that looks for information on Web pages. Such
information is indexed and stored in a vast database. In
carrying out its search, the search engine looks through
the database for matches to keywords subject to the
engine syntax. The search engine then presents to the
15 user a list of the Web pages it determines to be closest
to the requested query. Some significant search engines
are: AltaVista, Infoseek, Lycos, Magellan, Webcrawler
and Yahoo.

A generalized diagram of a portion of the Web to
20 which the computer controlled display terminal 57 used
for Web page receiving during searching or browsing is
connected as shown in Fig. 2. Computer display terminal
57 may be implemented by the computer system setup in
Fig. 1 and connection 58 (Fig. 2) is the network
25 connection shown in Fig. 1. For purposes of the present
embodiment, computer 57 serves as a Web display station
and has received displayed Web page 56. Reference may be
made to the above-mentioned _Mastering the Internet_, pp.
136-147, for typical connections between local display
30 stations to the Web via network servers, any of which may
be used to implement the system on which this invention
is used. The system embodiment of Fig. 2 has a host-dial
connection. Such host-dial connections have been in use

for over 30 years through network access servers 53 which
are linked 61 to the Web 50. The servers 53 may be
maintained by a service provider to the client's display
terminal 57. The host's server 53 is accessed by the
5   client terminal 57 through a normal dial-up telephone
linkage 58 via modem 54, telephone line 55 and modem 52.
The HTML file representative of the Web page 56 has been
downloaded to display terminal 57 through Web access
server 53 via the telephone line linkages from server 53,
10   which may have accessed them from the Internet 50 via
linkage 61. The Web browser program 59 operates within
the display terminals 57 to control the communication
with the Web access server 53 to thereby download and
display the accessed Web pages 56 on terminal 57. The
15   Web access server 53 uses one of the previously described
search engines 51 to access via the Web 50 the desired
sequence of Web pages from appropriate Web resources,
such as databases 60 and 62.

       With this setup, the present invention, which will
20   be subsequently described in greater detail with respect
to Figs. 3 through 8, may be carried out using Web
browser 59. Search engine 51 accesses the sequence of
Web pages and provides such pages to the user at terminal
57. Fig. 3 shows a Web page 70 conventionally displayed
25   on screen 56 of terminal 57. In addition to the actual
content 75 of the Web page, the screen is cluttered with
text and image extraneous to the content 75. For
example, there is: a segment of a Web advertisement 71;
an independent listing 72 of hyperlinks to a wide variety
30   of subject matter which has nothing to do with the
content 75 of the page 70; a link 73 to get Gift
Certificates; and a link 74 to Customer Service.
Actually, for purposes of clearly illustrating the

present invention, the clutter has been reduced. On the
typical Web page there may be left over frames and
segments from previous Web pages at different browser
levels. In any event, if the user chooses to use an
5   alternative mode of the Web page 70 which provides a
movable indicator to focus and direct the reading of the
pertinent page content 75 and the Web page designer has
provided such alternate modes, the user may click on the
"READER INDICATOR" button 69. This will result in the
10 listing shown in Fig. 4 that sets forth a menu of the
alternate page reader modes, 63 through 68, provided by
the Web page designer, i.e. where the movable
highlighting indicator is: a sentence block 63; a
paragraph block 64; a phrase block 65; NVP 66 - a
15 sequence of three blocks respectively defining the Noun,
Verb and Predicate; a block within which the text content
has an enlarged character size 68; as well as any other
mode 67 provided by the Web page designer. In this
illustration, the user has selected the Web page mode
20 wherein the moving highlighting block indicator has
defined a grammatical unit of sentence size 76 as shown
in Fig. 5 with the reader moving in the direction shown
by the arrow. Accordingly, the reader indicator block 77
moves to the next sentence as shown in Fig. 6 in the wrap
25 around orthogonal left to right and down direction as
indicated by arrows 78.

       If the user selects the "Enlarged" 68 Web read mode
item from the menu in Fig. 4, the result is the movable
reader block indicator shown in Fig. 7 wherein the text
30 within indicator block 80 is enlarged or magnified as a
further aid to the user of limited reading skills who is
being directed through the Web page. On the other hand,
if the user selects the "NVP" 66 item (Noun-Verb-

Predicate) from the menu in Fig. 4, the result is the multicolored block indicators shown in Fig. 8 in which the indicator block 81 defining the subject in the sentence is of a first color; the indicator block 82

5   defining the verb in the sentence is of a second color; and indicator block 83 defining the predicate in the sentence is of a third color. These three blocks will move sequentially one after another, sentence by sentence in the left to right and down orthogonal direction

10   described hereinabove with respect to Figs. 5 and 6. At the exact point in the reading shown in Fig. 8, the colored blocks 81 and 82 respectively defining the subject and the verb have already been passed as indicated by their block outline being in dashed lines,

15   and the block indicator 83 defining the predicate is the current reading point.

       As set forth above, the text within the reader indicator block may be distinguished from the remainder of the data on the Web page by either differences in

20   brightness or differences in color. In the case of multiple indicators as described above with respect to Fig. 8, then, in addition, these indicators may be distinguished from each other also by differences in color.

25   Fig. 9 is a flowchart showing the development of a process according to the present invention for creating, transmitting and displaying Web pages in a plurality of selectable modes for directing users of varying reading skills through a progressive reading of a Web page

30   controlled by a movable highlighting indicator in a predetermined progressive orthogonal pattern. Most of the programming functions in the process of Fig. 9 have already been described in general with respect to Figs. 3

through 8. A process is provided for rendering Web pages
at receiving Web display stations, step 85. A process is
provided to enable the creators and designers of Web
pages in HTML to create a number of modes in which the
5   Web page may selectably be read, step 86. New HTML tags
are provided for HTML documents to define the mode in
which the Web page is to be read at the receiving Web
station, step 87. Among the read modes in which the Web
page may be created is a mode where the direction of
10   reading is controlled by a highlighting indicator, step
88. Among the read modes in which the Web page may be
created are modes where the highlighting indicator is:
A) brighter, B) of different color, C) has a variable
speed, or D) variable dimensions, step 89. Web pages are
15   enabled to be created in a mode for reading text in Web
pages wherein the text in the highlighted indicator block
is enlarged so as to be easier to read, step 90.

     Finally, there is set up a process in a Web browser
at a receiving display station for monitoring and
20   decoding the new HTML tags in received Web pages and to
set up the Web page reading modes required by the tags as
selected by the user of the received Web page, step 91.

     The running of the process set up in Fig. 9 and
described in connection with Figs. 3 through 8 will now
25   be described with respect to the flowchart of Fig. 10.
Let us assume that we are in a Web browsing session
through the browser at the Web page receiving display
station. The flowchart represents some steps in a
routine that will illustrate the operation of the
30   invention. Initially, a determination is made as to
whether a Web page has been received, step 92. If No,
the process is returned to step 92 and the arrival of the
Web page ia awaited. If Yes, a further determination is

made as to whether the user has selected to read the Web page in one of the Web page reader modes, step 93. If No, then the Web page continues to be displayed and used in the normal mode, step 94. If Yes, the user has

5   selected to use one of the Web page reader modes, then, step 95, the menu of selectable Web page reading modes is displayed as shown in Fig. 4 so that the user may make his selection. Then the user makes one of the following selections: step 96, if he selects to use the sentence

10   highlighter mode, the directional reader sentence indicator mode as shown in Figs. 5 and 6 is used, step 97; then, step 98, if he selects to use the paragraph highlighter mode, the directional reader paragraph indicator mode is used, step 100; then, step 99, if he

15   selects to use the phrase highlighter mode, the directional phrase paragraph indicator mode is used, step 101; and, step 102, if he selects to use the enlarged text highlighter mode, the directional reader enlarged indicator mode, as shown in Fig. 7, is used, step 103.

20   After each of steps 94, 97, 100, 101 and 103 wherein a Web page is displayed either in the normal or special reading modes, a determination is made as to whether the session is over, step 104. If Yes, the session is exited. If No, the process is branched back to step 92

25   via branch "A" and the process is continued.

         It has been indicated that it is the function of the Web page designers to provide the Web pages in the alternate reader modes that the user may select and have rendered through his Web browser. This function requires

30   the inclusion of the reader variations in the HTML document representative of the Web which are then rendered by the Web browser into the natural language displayed Web page. Appropriate HTML tags identify the

reader mode functions and trigger the browser to carry out the routines for directing the movement and extent of the indicator blocks for traversing the content of the Web page in the modes described above.

5   For example the Web browser could be triggered to respectively perform the functions respectively shown in Fig. 8 by the following HTML example to produce an output at the receiving station wherein the subject, verb and predicate indicator blocks each has a different color:

10   **Markup Example**
       Content to be read:
       The cat went in the house

       New Markup Language:
       </p><subject>The
15   Cat</subject><verb>went</verb><predicate>in the
       house</predicate>

       <attributes>
       key=subject, color=red, outlineblock=false;
       key=verb, color=green, outlineblock=false;
20   key=predicate, color=blue,outlineblock=true;

       key=separation_of_sentence parts=3 spaces
       key=separation_between_sentences=10 spaces (multiple
       sentences allowed per line)
       key=different_sentences_allowed_on_same_line=true
25   </attributes>

The resulting natural language output from the browser would be: *The cat* went in the house.

(Wherein, the subject, verb and predicate would be sequentially within indicator blocks of different colors.)

The following is an example of a generalized code sequence of the steps in a receiving station browser to render the reading of a Web page sequence in accordance with the markup example:

```
 5              Rendering of Web Page by Browser
        Get Attributes of sentence Parts
            For Subject
                Store color
                Store outline
10                      ....etc.
            For Verb
                Store color
                Store outline
                        ....etc.
15          For Predicate
                Store color
                Store outline
                        ....etc.

        Get Text From Markup Content

20      Get Starting Location for display (xleft,ytop) ofleft,
        top corner

        For Each Sentence loop:
            Get Subject from sentence
            Read in Attributes
25          Create font object using attributes
            Create string of subject with font
            if (one sentence per line)
                xnew=xleft;
                ynew=ynew+1;
30              Draw subject string at (xnew,ynew);
            else
                xnew=xnew+sentence separation;
                Draw subject string at (xnew,ynew);

            Get Verb from sentence
35          Read in Attributes
            Create font object using attributes
            Create string of verb with font
            if (one sentence per line)
                xnew=xleft;
40              ynew=ynew+1;
                Draw subject string at (xnew,ynew);
            else
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            xnew=xnew+sentence separation;
            Draw subject string at (xnew,ynew);

            Get Predicate from sentence
            Read in Attributes
  5         Create font object using attributes
            Create string of predicate with font
            if (one sentence per line)
                 xnew=xleft;
                 ynew=ynew+1;
 10              Draw subject string at (xnew,ynew);
            else
                 xnew=xnew+sentence separation;
                 Draw subject string at (xnew,ynew);
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15   In the above descriptions, the examples of Web page

reading modes were directed to aid people of limited

reading skills. The system of this invention may also be

used as an aid for people of superior reading skills,

e.g. speed readers. A great many speed reading systems

20   rely on orthogonal scanning of the central core of the

readable content in a very rapid left to right and down

direction. Block highlighting indicators in accordance

with the present invention can be created and carried out

to enhance the efforts of speed readers.

25   One of the preferred implementations of the present

invention is in application program 40, i.e. a browser

program made up of programming steps or instructions

resident in RAM 14, Fig. 1, of a Web receiving station

during various Web operations. Until required by the

30   computer system, the program instructions may be stored

in another readable medium, e.g. in disk drive 20, or in

a removable memory such as an optical disk for use in a

CD-ROM computer input, or in a floppy disk for use in a

floppy disk drive computer input. Further, the program

instructions may be stored in the memory of another
computer prior to use in the system of the present
invention and transmitted over a LAN or a WAN, such as
the Web itself, when required by the user of the present

5   invention. One skilled in the art should appreciate that
the processes controlling the present invention are
capable of being distributed in the form of computer
readable media of a variety of forms.

Although certain preferred embodiments have been

10 shown and described, it will be understood that many
changes and modifications may be made therein without
departing from the scope and intent of the appended
claims.